

A Co-excited Self-complementary Bow-Tie and Half-Loop Antenna

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A novel co-excited self-complementary bow-tie and half-loop antenna is presented for UWB applications. The self-complementary bow-tie consists of a rounded edge triangular monopole antenna on the top layer of a substrate with a bended $50\ \Omega$ microstrip feed line and an opposite rounded edge triangular slot on its ground plane on the bottom layer. The co-located half-loop is placed on the top layer of the substrate. One end of the loop connects to the feed line and the other end connects to the ground plane through a via. The antenna can be viewed as a 2D magneto-electric antenna that generates a circular polarization (CP) wave with improved gain. The self-complementary structure avoids the use of a balun and a tuning-matching circuit over an ultra-wide band, thus reducing the overall antenna size and the associated loss. CST simulations were performed. Dielectric substrate FR4 of 1.6mm thickness, with relative permittivity of 4.3 and dielectric loss tangent of 0.025, was used. Simulation results reveal that it has a wide bandwidth from 4 GHz to 30 GHz for return loss below -10dB, a gain of 3-5 dBi over the whole operation frequency band and it is directly matched to the (SMA) connector via $50\ \Omega$ microstrip feed line without using balun or a multi-section microstrip line of different widths or a gradually-widened microstrip line. Moreover, significant improvements in antenna performance are achieved by using a bow-tie with a rounded edge instead of using conventional flat-ended ones. Antennas with rounded patches provide wider bandwidth with higher co-polarization and lower cross-polarization levels for the UWB range.